



CLAIMS (IN AMENDED FORM)

1. (Previously Amended) A method of assaying molecules in a sample comprising the steps of:
 - providing a sample that contains one or more target molecules or molecular complexes;
 - contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;
 - subjecting said target-probe complex to an applied magnetic field so as to induce magnetization; and
 - measuring and characterizing a magnetic signal of said target-probe complex induced by said applied magnetic field to determine a hysteresis loop of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.
2. (Original) The method of claim 1, wherein said target molecule or molecular complex is disposed on a support.
3. (Previously Amended) The method of claim 2, wherein said target molecule or molecular complex is disposed on the support in an array.
4. (Previously Amended) The method of claim 3, wherein said array is an addressable array.
5. (Previously Amended) The method of claim 1, wherein said one or more probes are disposed on a support.
6. (Previously Amended) The method of claim 5, wherein said one or more probes are disposed on the support in an array.
7. (Original) The method of claim 6, wherein said array is an addressable array.
8. (Previously Amended) The method of claim 1, wherein said

measuring and characterizing is of a magnitude of the magnetic signal resulting from magnetization induced in said target-probe complex in response to said applied magnetic field.

9. (Previously Amended) The method of claim 1, wherein said measuring and characterizing comprises:

providing a magnetic sensor; and

generating the magnetic signal with the magnetic sensor in response to magnetic characteristics of the target-probe complex.

10. (Previously Amended) A method of assaying molecules in a sample comprising the steps of:

providing a sample that contains one or more target molecules or molecular complexes;

contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

subjecting said target-probe complex to an applied magnetic field so as to induce magnetization;

generating a signal with a giant magnetoresistive ratio magnetic sensor in response to the applied magnetic field.

11. (Previously Amended) The method of claim 9, wherein said measuring and characterizing comprises:

providing a signal processing means that generates readable output from said signal.

12. (Previously Amended) The method of claim 9

wherein said one or more target molecules or molecular complexes are disposed on a support;

and wherein said measuring and characterizing comprises:

moving the support and the sensor in relation to each other in one or more directions.

13. (Previously Amended) The method of claim 1, further comprising:

subjecting said target-probe complex to one or more of a plurality of applied magnetic fields having different intensities.

14. (Previously Amended) The method of claim 1, further comprising:

subjecting said target-probe complex to one or more of a plurality of applied magnetic fields having different directions.

15. (Previously Amended) The method of claim 1, further comprising:

contacting the one or more target molecules or molecular complexes with a non-magnetic colloid so as to reduce non-specific binding of the one or more probes to the target molecules or molecular complexes.

16. (Previously Amended) The method of claim 1, further comprising:

joining the one or more probes to one or more colored beads, fluorescent beads, or fluorescent cells.

17. (Previously Amended) The method of claim 1, further comprising the step of detecting the presence of said target-probe complex by visual, electronic or optical means.

103. (Previously Amended) A method of assaying molecules in a sample comprising the steps of:

providing a sample that contains one or more target molecules or molecular complexes;

contacting said one or more target molecules or molecular complexes with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

subjecting said target-probe complex to an applied magnetic field so as to induce magnetization; and

measuring and characterizing a time response, called the

magnetic swing time, of the magnetic signal resulting from magnetization induced in said target-probe complex in response to said applied magnetic field.

104. (Previously Amended) The method of claim 1, wherein said measuring and characterizing is additionally of a spatial orientation of the magnetic signal resulting from magnetization induced in said target-probe complex in response to said applied magnetic field.

105. (Canceled)

106. (Previously Amended) The method of claim 1 wherein measuring and characterizing of the hysteresis loop also measures and characterizes the spatial orientation of the target-probe complex, and thus said one or more of the presence, location, orientation and quantity of the target-probe complex.

107. (Previously Amended) The method of claim 1 wherein measuring and characterizing of the hysteresis loop also measures and characterizes the saturation magnetization of the target-probe complex, and thus said one or more of the presence, location, orientation and quantity of the target-probe complex.

108. (Previously Amended) The method of claim 1 wherein measuring and characterizing of the hysteresis loop also measures and characterizes the remnant magnetization of the target-probe complex, and thus said one or more of the presence, location, orientation and quantity of the target-probe complex, ~~—~~.

109. (Previously Amended) The method of claim 1 wherein

measuring and characterizing of the hysteresis loop also measures and characterizes the coercive force of the target-probe complex, and thus said one or more of the presence, location, orientation and quantity of the target-probe complex.

110. (Previously Added) The method of claim 1, further comprising:

subjecting said target-probe complex to one or more of a plurality of applied electric fields having different intensities.

111. (Previously Added) The method of claim 1, further comprising:

subjecting said target-probe complex to one or more of a plurality of applied electric fields having different directions.

112. (Previously Added) The method of claim 1 wherein the contacting of said target is with one or more probes containing a ferromagnetic material as the magnetic label.

113. (Previously Amended) The method of claim 1 wherein the contacting of said target is with one or more probes containing a ferrofluid as the magnetic label.

114. (Previously Added) The method of claim 1 wherein the contacting of said target is with one or more probes containing a paramagnetic material as the magnetic label.

115. (Previously Added) The method of claim 1 wherein the contacting of said target is with one or more probes containing a superparamagnetic material as the magnetic label.

116. (Currently Amended) A method of assaying molecules in a sample comprising the steps of:

providing a sample that contains one or more target molecules or molecular complexes;

contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

subjecting ~~a substantially planar sample of~~ said target-probe complex to an applied magnetic field so as to induce magnetization of the target-probe complex; and

scanning in a raster-scan motion with a magnetic sensor a magnetic signal of said target-probe complex induced by said applied magnetic field so as to identify any of the presence, location, orientation and quantity of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

117. (Previously Added) The method of claim 116, wherein the determining of the magnetic signal of said target-probe complex induced by said applied magnetic field also determines a time response, called magnetic swing time, of the target-probe complex, and thus also of the one or more target molecules or molecular complexes

118. (Previously Added) The method of claim 116, wherein the determining of the magnetic signal of said target-probe complex induced by said applied magnetic field also determines the spatial orientation of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

119. (Previously Added) The method of claim 116, wherein the determining of the magnetic signal of said target-probe complex induced by said applied magnetic field determines a hysteresis loop that is solvable for any of (1) saturation magnetization, (2) remnant magnetization, (3) coercive force and (4) magnetic magnitude.

120. (Previously Added) The method of claim 10 further comprising:

determining from the generated signal a time response, called magnetic swing time, of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

121. (Previously Added) The method of claim 10 further comprising:

determining from the generated signal the spatial orientation of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

122. (Previously Added) The method of claim 10 further comprising:

determining from the generated magnetic signal a hysteresis loop that is solvable for any of (1) saturation magnetization, (2) remnant magnetization, (3) coercive force and (4) magnetic magnitude.

123. (Previously Added) The method of claim 103 wherein the measuring and characterizing is further of the spatial orientation of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

124. (Previously Added) The method of claim 103 wherein the measuring and characterizing is further of the hysteresis loop of the target-probe complex which hysteresis loop is solvable for any of (1) saturation magnetization, (2) remnant magnetization, (3) coercive force and (4) magnetic magnitude.

125. (Canceled)

126. (Currently Amended) ~~The~~ A method of ~~claim 125 further~~ of assaying molecules in a sample comprising the steps of:

providing a sample that contains one or more target molecules or molecular complexes;

contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

subjecting said target-probe complex to an applied saturation magnetic field in the plane of the sample so as to induce saturation magnetization of the target-probe complex; and

measuring and characterizing with a magnetic sensor a magnetic signal of said target-probe complex induced by said applied magnetic field so as to identify and determine any of the presence, location, orientation and quantity of the target-probe complex, and thus also of the one or more target molecules or molecular complexes; and

determining from the measured and characterized magnetic signal a time response, called magnetic swing time, of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

127. (Currently Amended) ~~The~~ A method of ~~claim 125 further~~ of assaying molecules in a sample comprising the steps of:

providing a sample that contains one or more target molecules or molecular complexes;

contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

subjecting said target-probe complex to an applied saturation magnetic field in the plane of the sample so as to induce saturation magnetization of the target-probe complex; and

measuring and characterizing with a magnetic sensor a magnetic signal of said target-probe complex induced by said applied magnetic field so as to identify and determine any of the presence, location, orientation and quantity of the target-probe complex, and thus also of the one or more target molecules or molecular complexes; and

determining from the measured and characterized signal the spatial orientation of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

128. (Currently Amended) ~~The A method of claim 125 further of~~
assaying molecules in a sample comprising the steps of:

providing a sample that contains one or more target molecules or molecular complexes;

contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

subjecting said target-probe complex to an applied saturation magnetic field in the plane of the sample so as to induce saturation magnetization of the target-probe complex; and

measuring and characterizing with a magnetic sensor a magnetic signal of said target-probe complex induced by said applied magnetic field so as to identify and determine any of the

presence, location, orientation and quantity of the target-probe complex, and thus also of the one or more target molecules or molecular complexes; and

determining from the measured and characterized magnetic signal a hysteresis loop that is solvable for any of (1) saturation magnetization, (2) remnant magnetization, (3) coercive force and (4) magnetic magnitude.

129. (Canceled) .

130. (Currently Amended) ~~The A method of claim 129 further assaying molecules in a sample comprising the steps of:~~

providing a sample that contains one or more target molecules or molecular complexes;

contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

subjecting a sample of said target-probe complex to an applied magnetic field the so as to induce magnetization of the target-probe complex;

measuring and characterizing with a magnetic sensor a magnetic field of said target-probe complex so as to identify and determine any of the presence, location, orientation and quantity of the target-probe complex, and thus also of the one or more target molecules or molecular complexes; and

determining from the measured and characterized magnetic field of the target-probe complex a time response, called magnetic swing time, of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

131. (Currently Amended) The A method of ~~claim 129~~ further assaying molecules in a sample comprising the steps of:

_____ providing a sample that contains one or more target molecules or molecular complexes;

_____ contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

_____ subjecting a sample of said target-probe complex to an applied magnetic field the so as to induce magnetization of the target-probe complex;

_____ measuring and characterizing with a magnetic sensor a magnetic field of said target-probe complex so as to identify and determine any of the presence, location, orientation and quantity of the target-probe complex, and thus also of the one or more target molecules or molecular complexes; and

determining from the measured and characterized magnetic field the orientation of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

132. (Currently Amended) The A method of ~~claim 129~~ further assaying molecules in a sample comprising the steps of:

_____ providing a sample that contains one or more target molecules or molecular complexes;

_____ contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

_____ subjecting a sample of said target-probe complex to an applied magnetic field the so as to induce magnetization of the target-probe complex;

_____ measuring and characterizing with a magnetic sensor a magnetic field of said target-probe complex so as to identify and

determine any of the presence, location, orientation and quantity of the target-probe complex, and thus also of the one or more target molecules or molecular complexes; and

determining from the measured and characterized magnetic field a hysteresis loop of the target probe complex, which hysteresis loop is solvable for any of (1) saturation magnetization, (2) remnant magnetization, and (3) coercive force.

133. (Canceled)

134. (Currently Amended) ~~The~~ A method of ~~claim 133~~ further assaying molecules in a sample comprising the steps of:

_____ providing a sample that contains one or more target molecules or molecular complexes;

_____ contacting said target with one or more probes under conditions which permit the formation of a target-probe complex, wherein the probe comprises one or more magnetic labels;

_____ applying a magnetic field to the target-probe complex so as to induce magnetization of the target-probe complex; and

_____ measuring and characterizing with a magnetic sensor the magnetic field of said target-probe complex while moving the target probe complex relative to the applied magnetic field, therein to determine the magnetic field of the target-probe complex, and thus also of the one or more target molecules or molecular complexes that are part of the target-probe complex; and

determining from the measured and characterized magnetic field of the target-probe complex a time response, called magnetic swing time, of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

135. (Currently Amended) ~~The A method of claim 133 further~~
assaying molecules in a sample comprising the steps of:
providing a sample that contains one or more target
molecules or molecular complexes;
contacting said target with one or more probes under
conditions which permit the formation of a target-probe complex,
wherein the probe comprises one or more magnetic labels;
applying a magnetic field to the target-probe complex so as
to induce magnetization of the target-probe complex; and
measuring and characterizing with a magnetic sensor the
magnetic field of said target-probe complex while moving the
target probe complex relative to the applied magnetic field,
therein to determine the magnetic field of the target-probe
complex, and thus also of the one or more target molecules or
molecular complexes that are part of the target-probe complex;
and

determining from the measured and characterized magnetic field the orientation of the target-probe complex, and thus also of the one or more target molecules or molecular complexes.

136. (Currently Amended) ~~The A method of claim 133 further~~
assaying molecules in a sample comprising the steps of:
providing a sample that contains one or more target
molecules or molecular complexes;
contacting said target with one or more probes under
conditions which permit the formation of a target-probe complex,
wherein the probe comprises one or more magnetic labels;
applying a magnetic field to the target-probe complex so as
to induce magnetization of the target-probe complex; and
measuring and characterizing with a magnetic sensor the
magnetic field of said target-probe complex while moving the

target probe complex relative to the applied magnetic field,
therein to determine the magnetic field of the target-probe
complex, and thus also of the one or more target molecules or
molecular complexes that are part of the target-probe complex;
and

determining from the measured and characterized magnetic
filed a hysteresis loop of the target probe complex, which
hysteresis loop is solvable for any of (1) saturation
magnetization, (2) remnant magnetization, and (3) coercive force.